# Improving Great Lakes Water Balance Forecasting through Regionalized Calibration of the Large Basin Runoff Model

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Great Lakes Environmental Research Laboratory,National Oceanic and Atmospheric Administration

Great Lakes Operational Meteorology Workshop
Chicago, IL
March 14-16, 2012

# Outline

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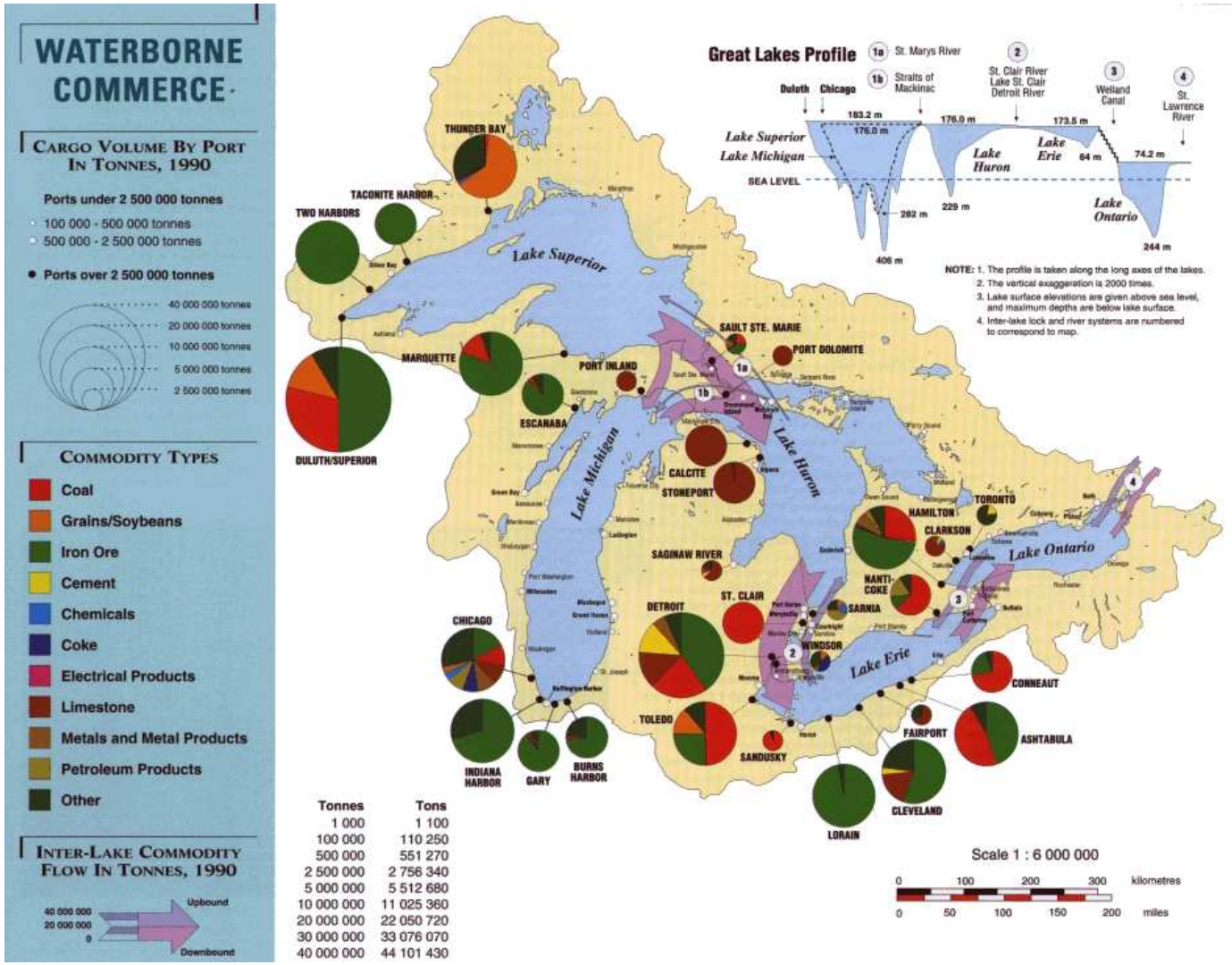
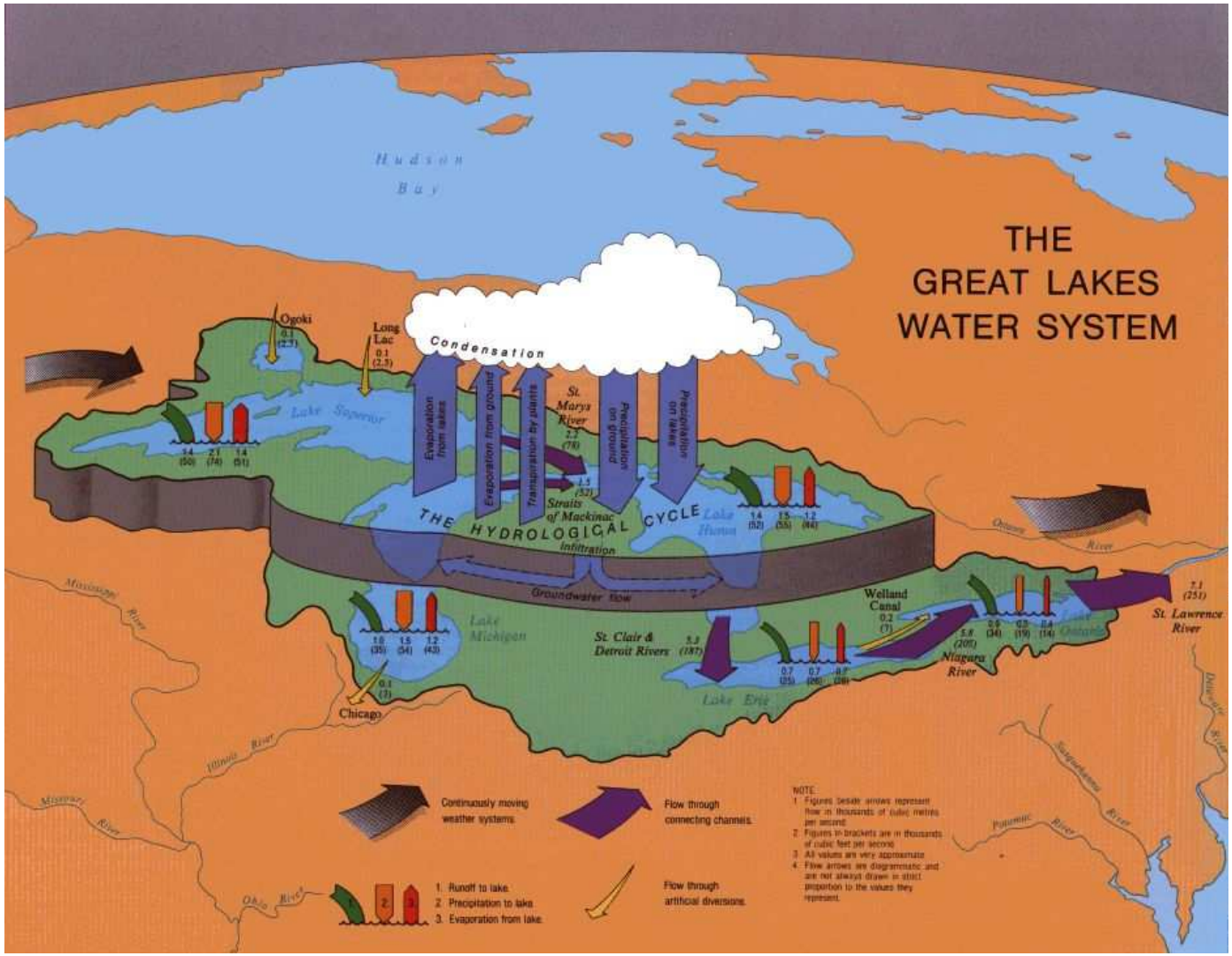
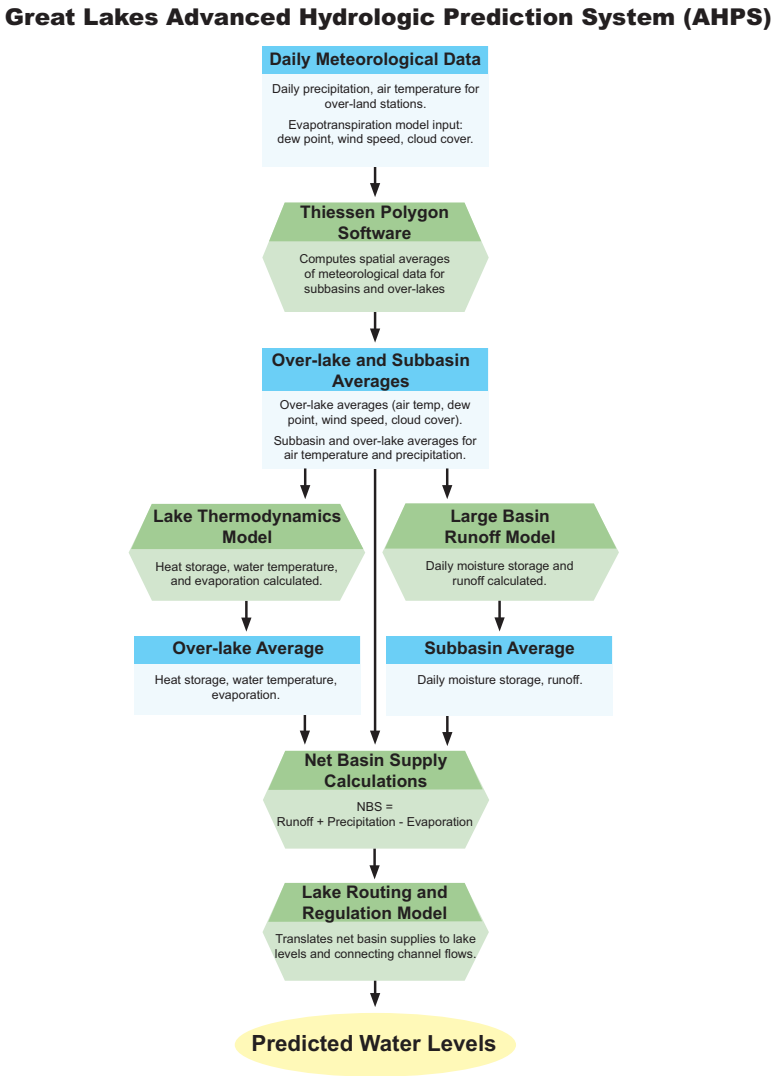
# Economic Importance



# Great Lakes Water Balance



# Predicting Water Levels - Great Lakes AHPS



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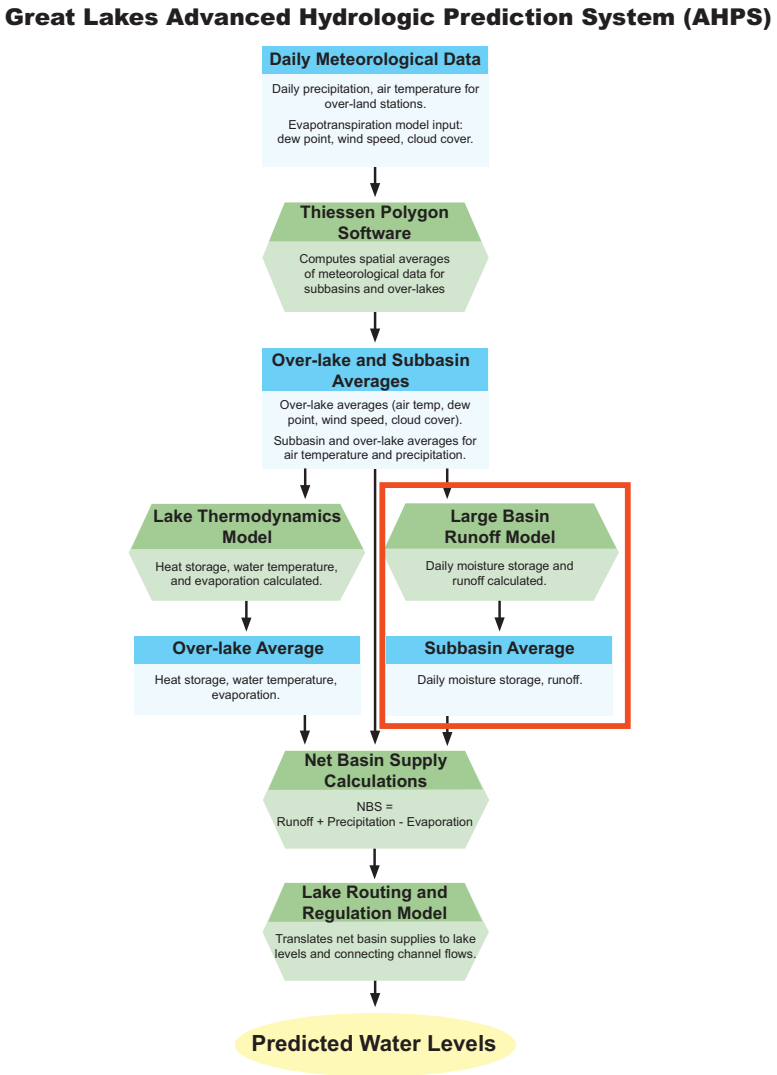
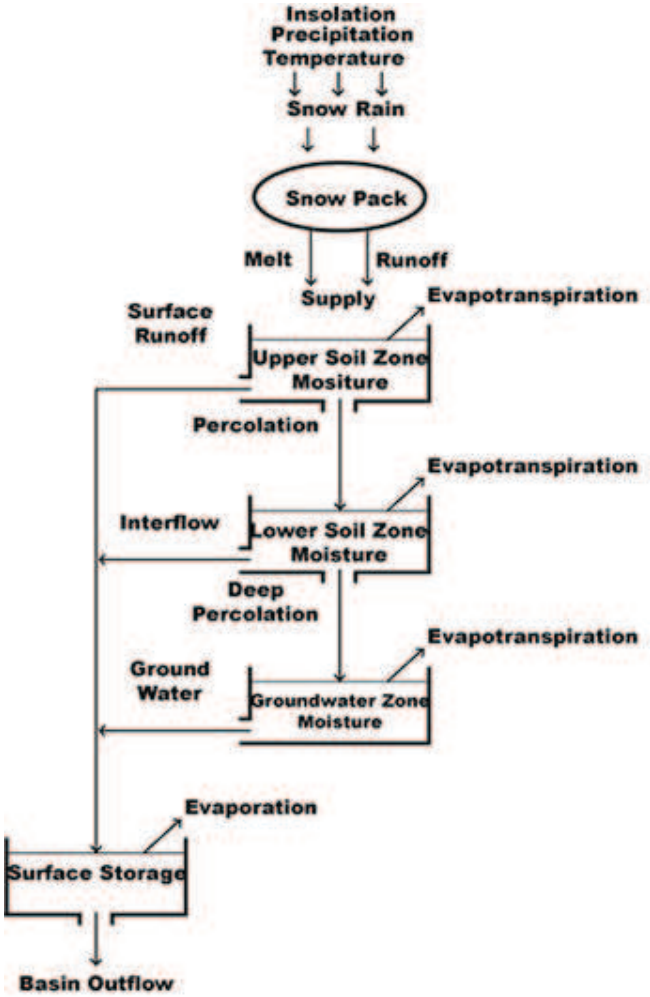
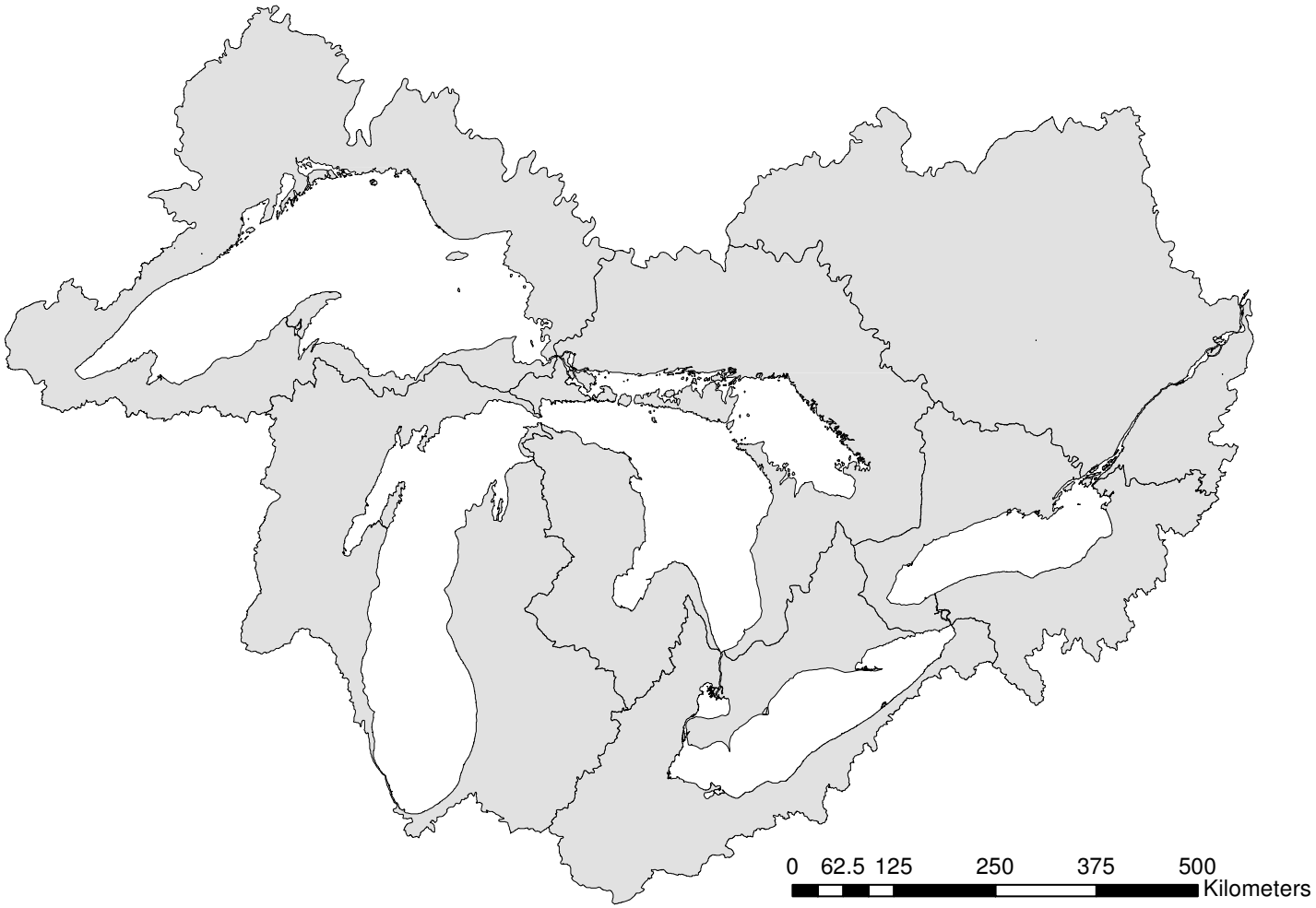


# Large Basin Runoff Model



# Observing Runoff



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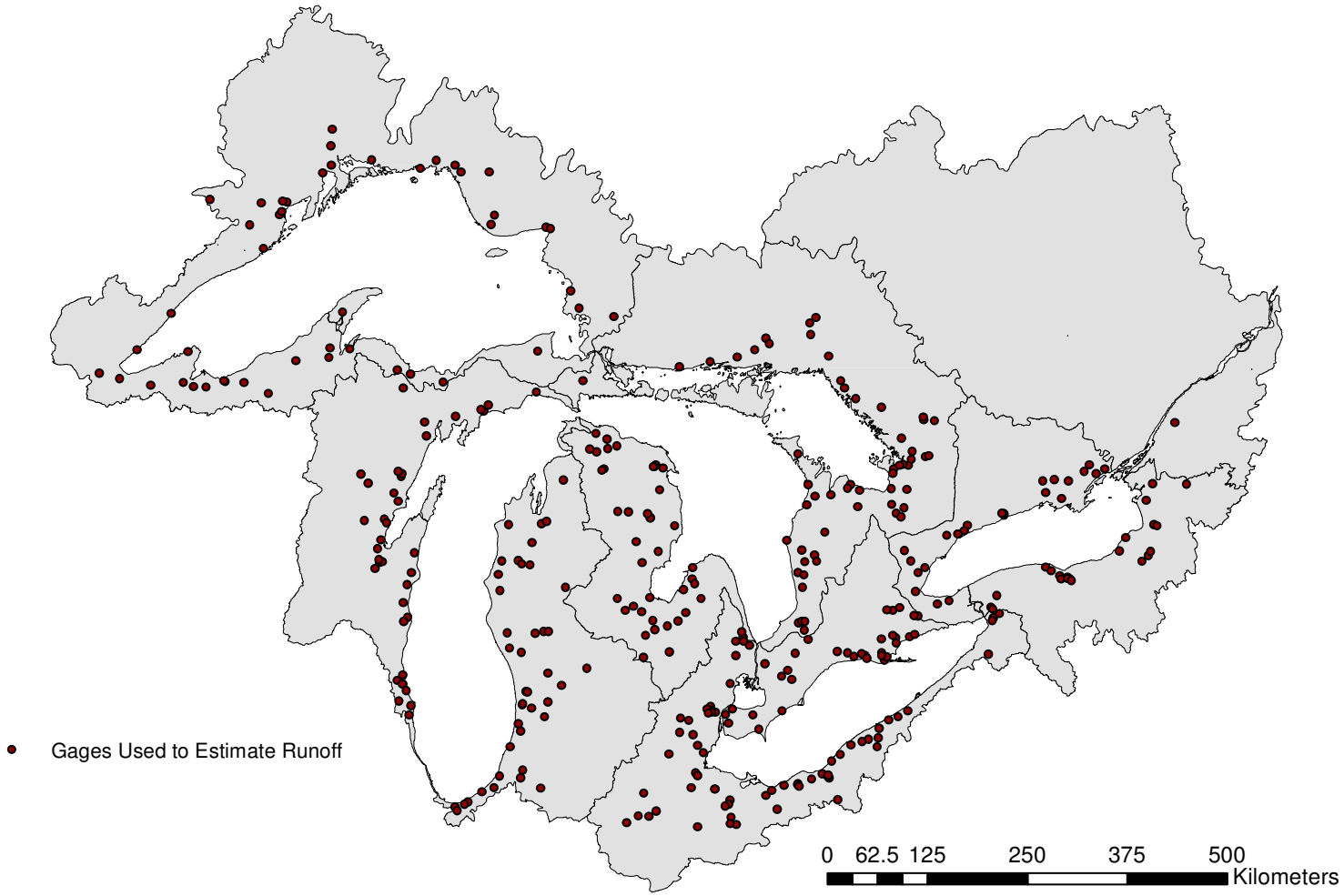

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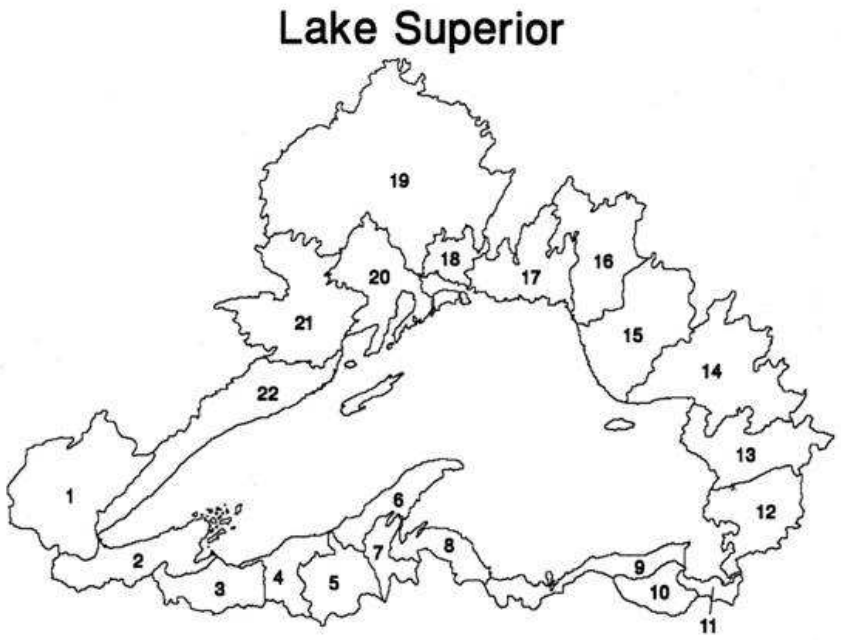

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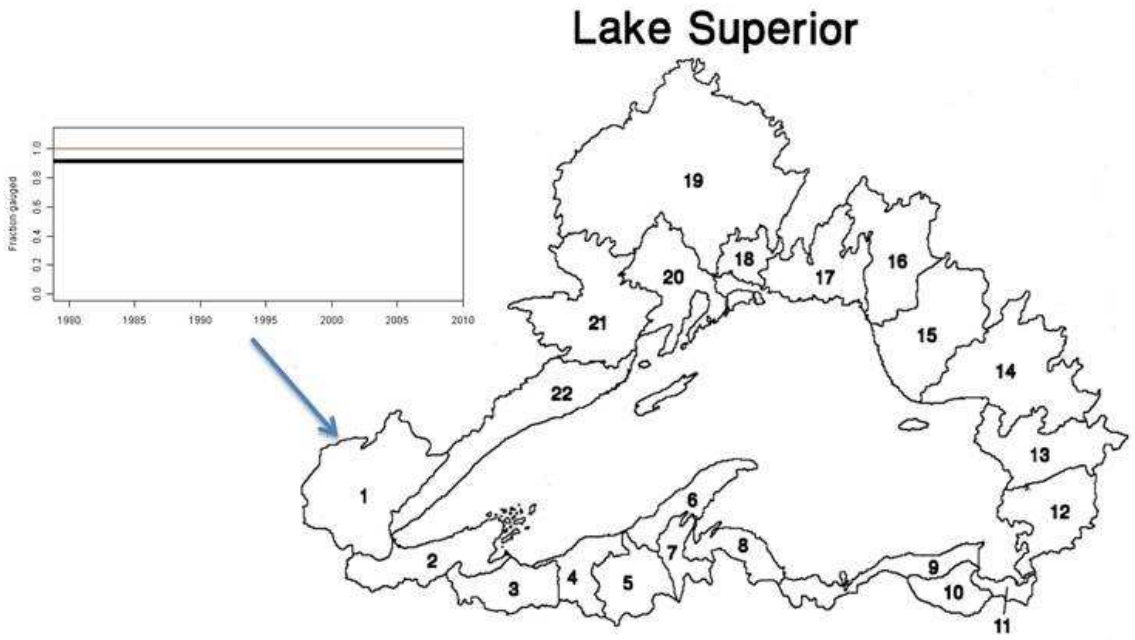

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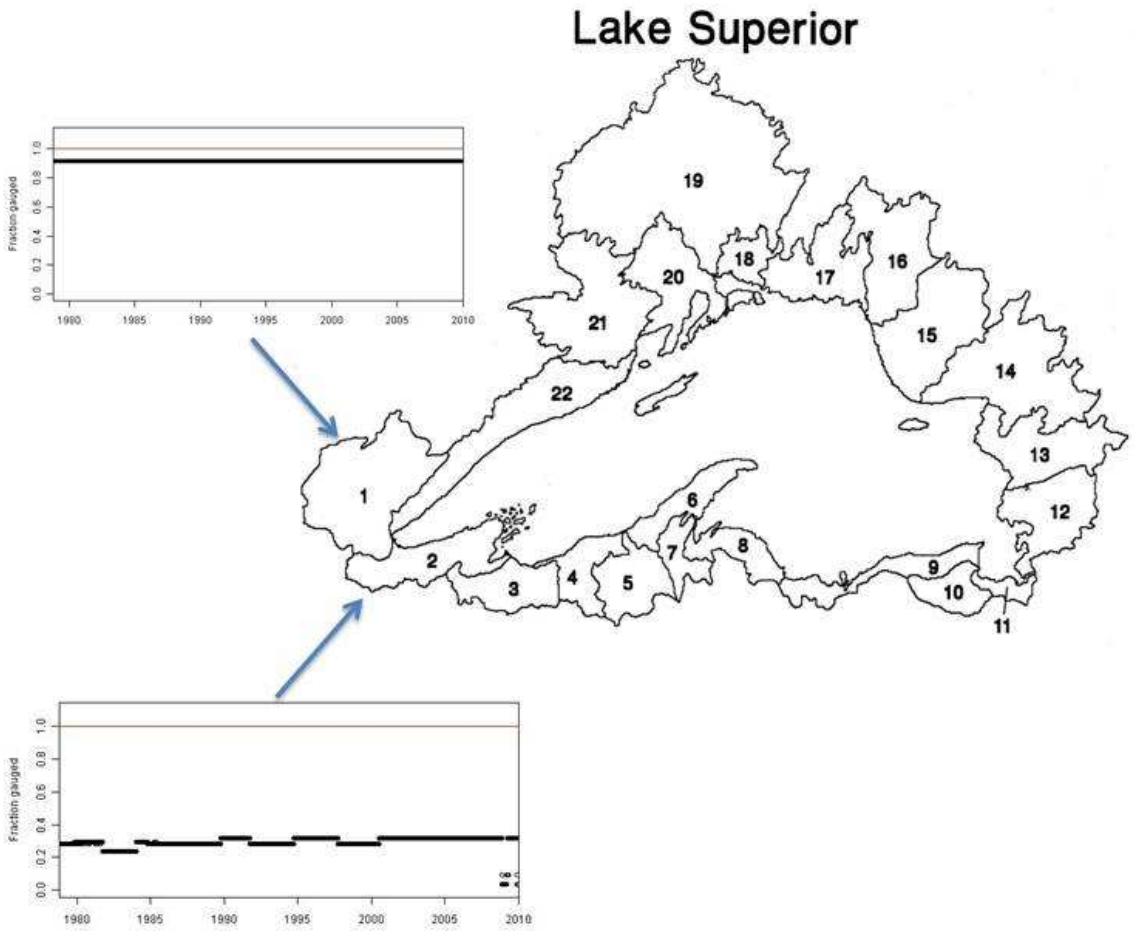

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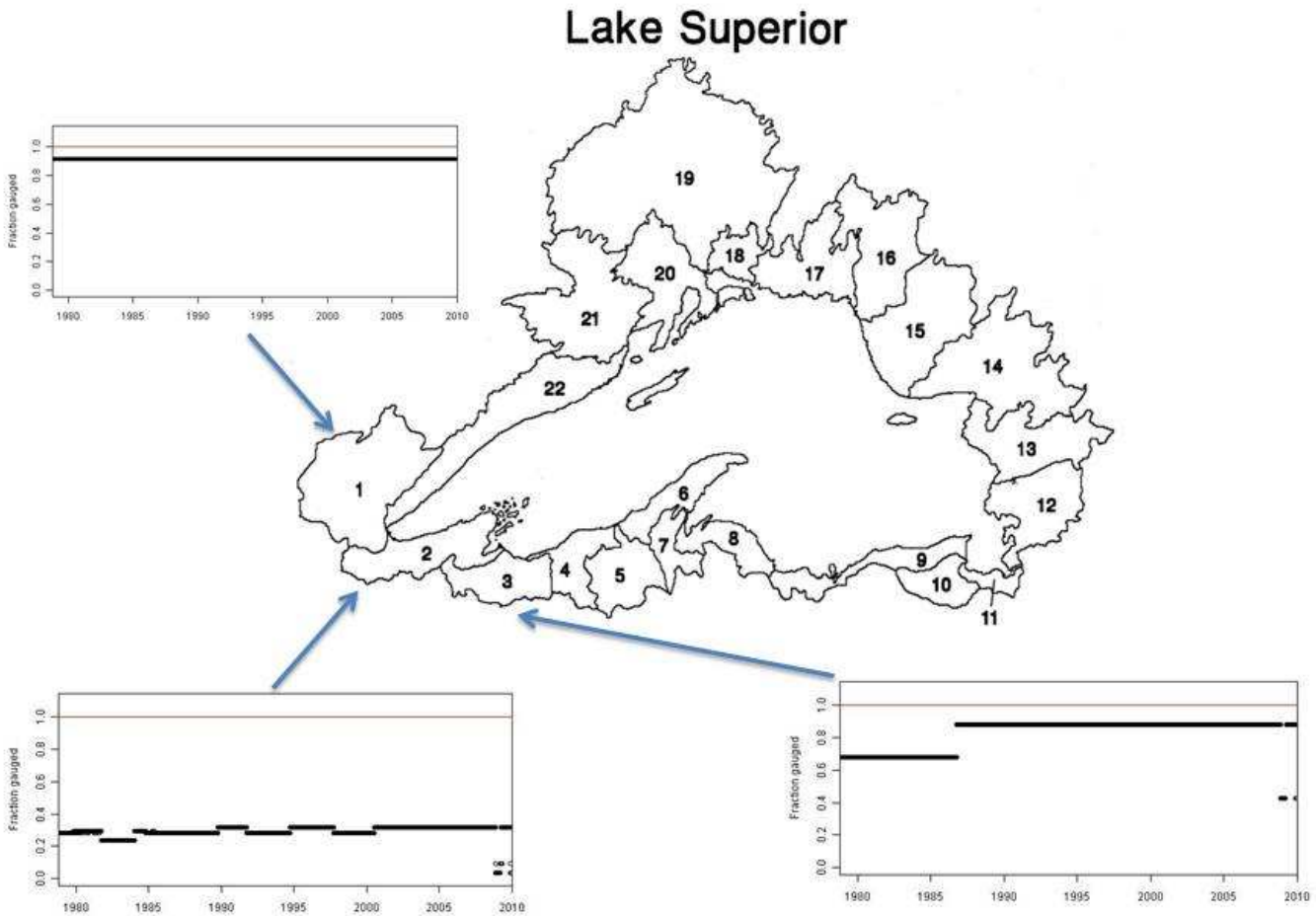

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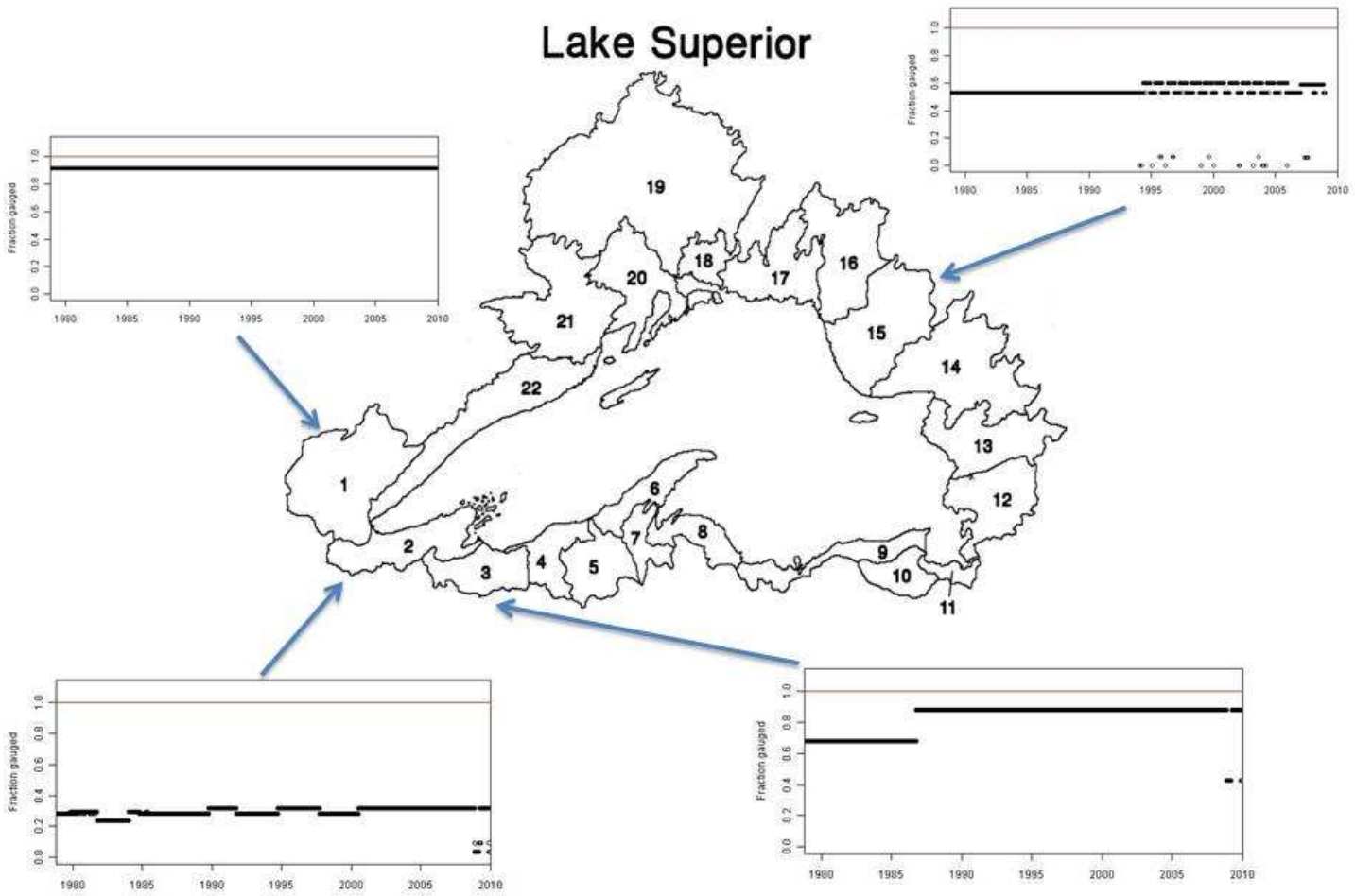
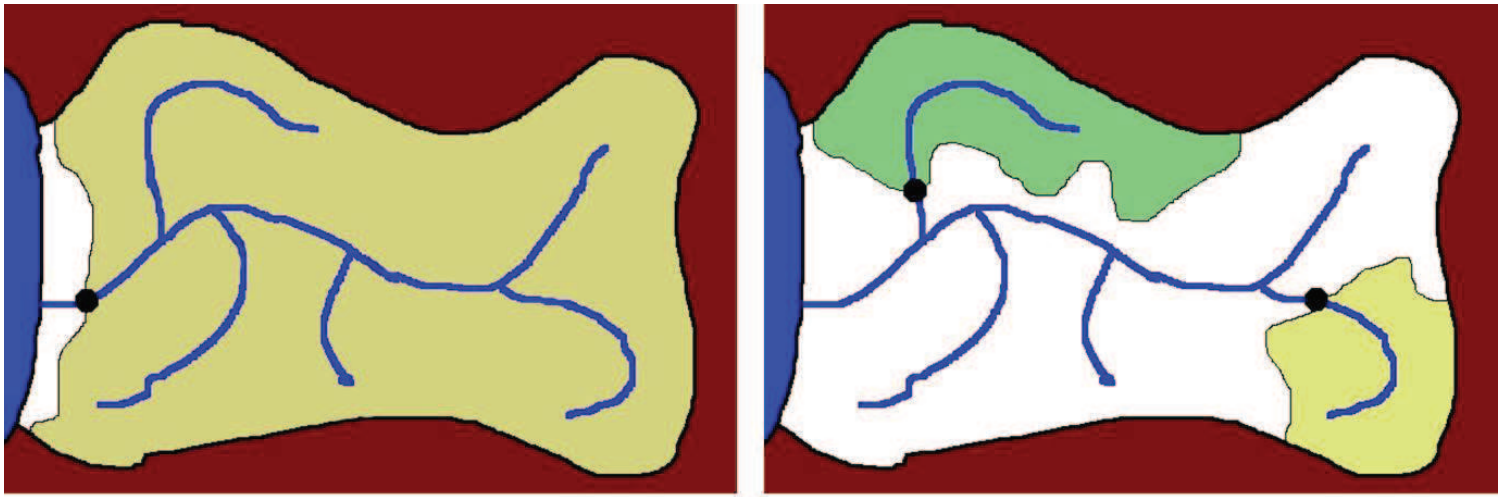
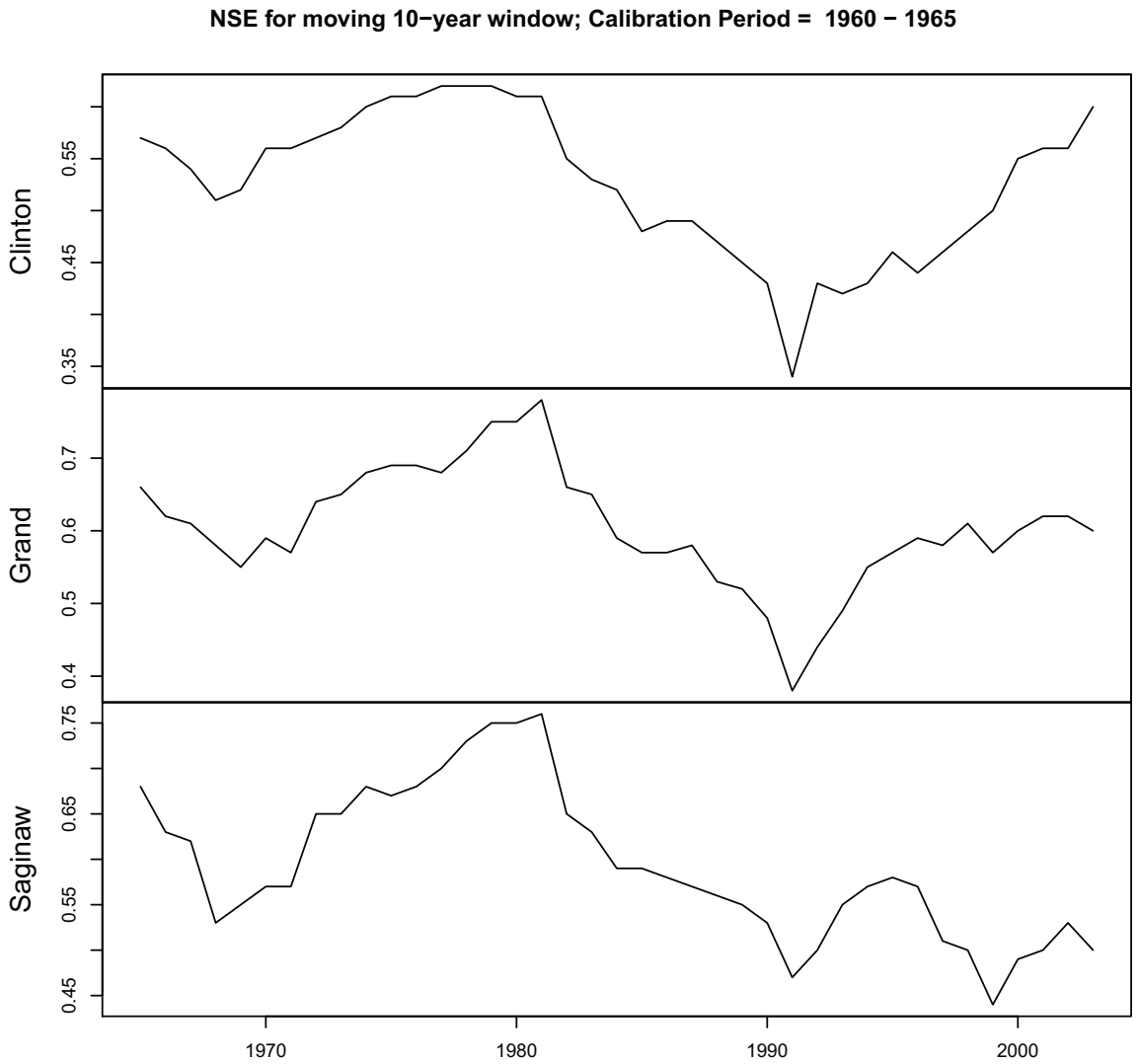


# Observed Runoff Estimates (Area Ratio Method)



$$Q_{subbasin} = \frac{Area_{subbasin}}{\sum Area_{gauge}} * \sum Q_{gauge}$$

# Evaluation of Previous LBRM Calibration



# Outline

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- New ways to incorporate geospatial information on drivers of hydrologic response

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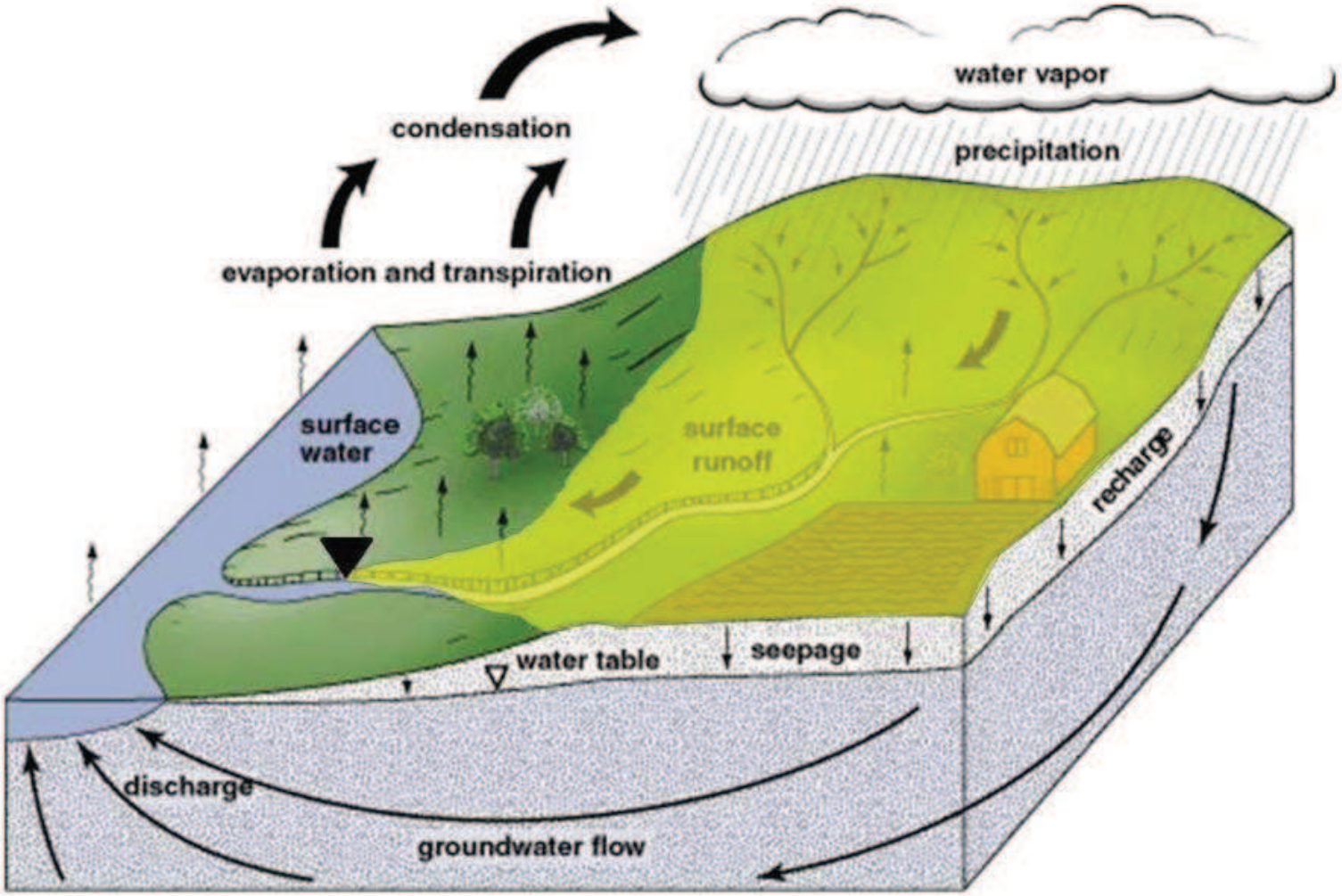

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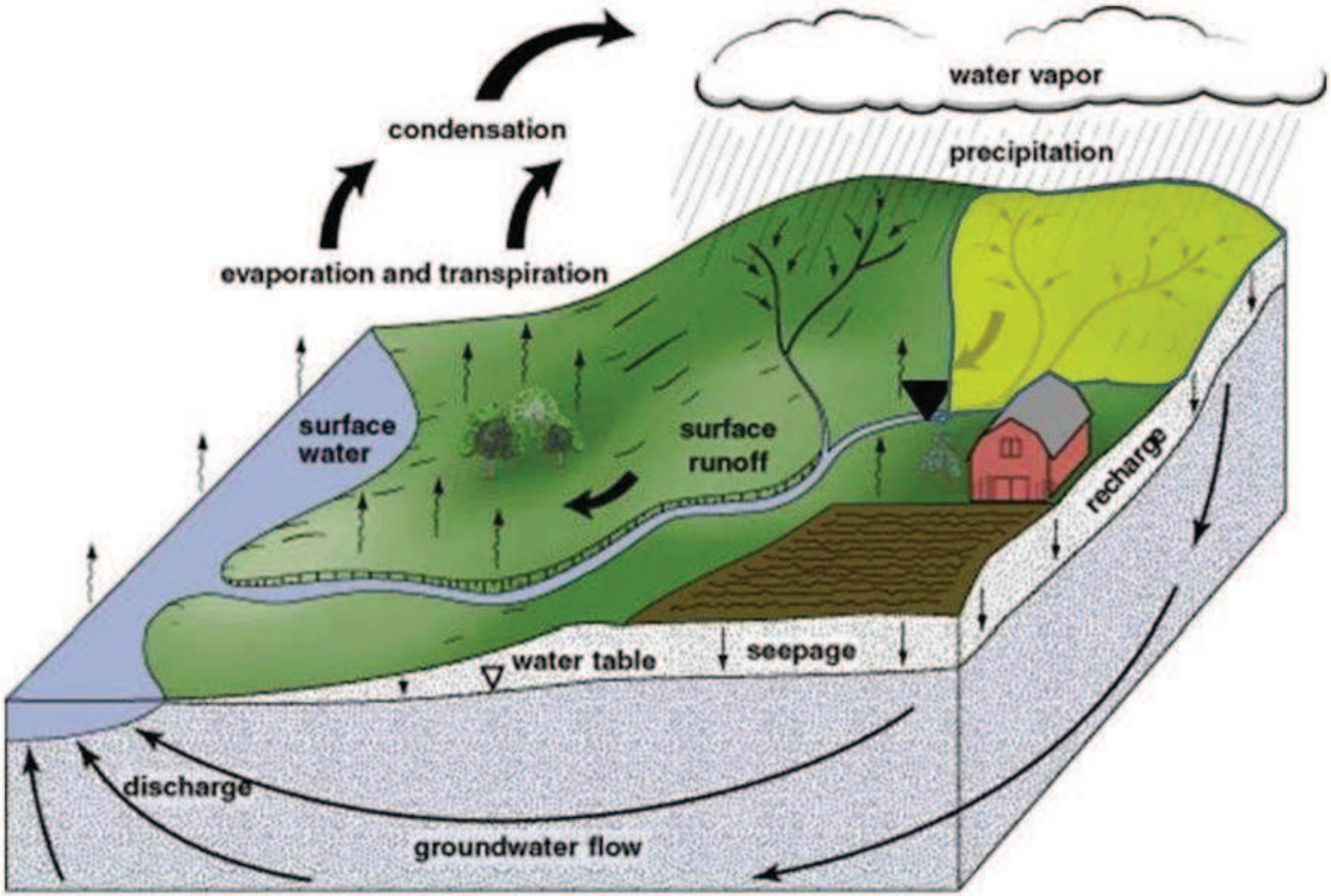

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- Climate
  - Precipitation (quantity, seasonality, percent as snow)
  - Temperature

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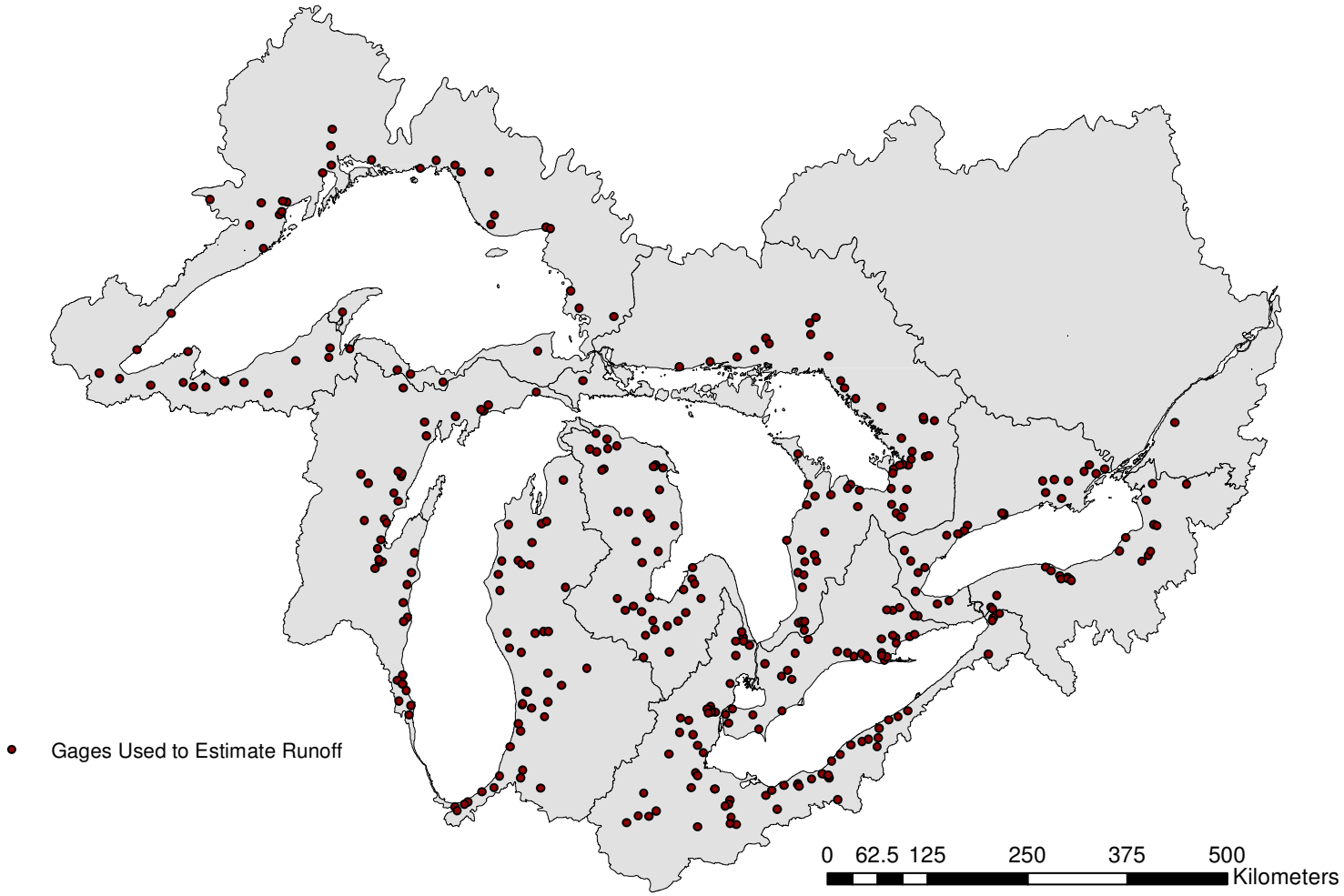
- New PUB methods calibrate by constraining model output to hydrologic response based on watershed characteristics

# Hydrologic Response



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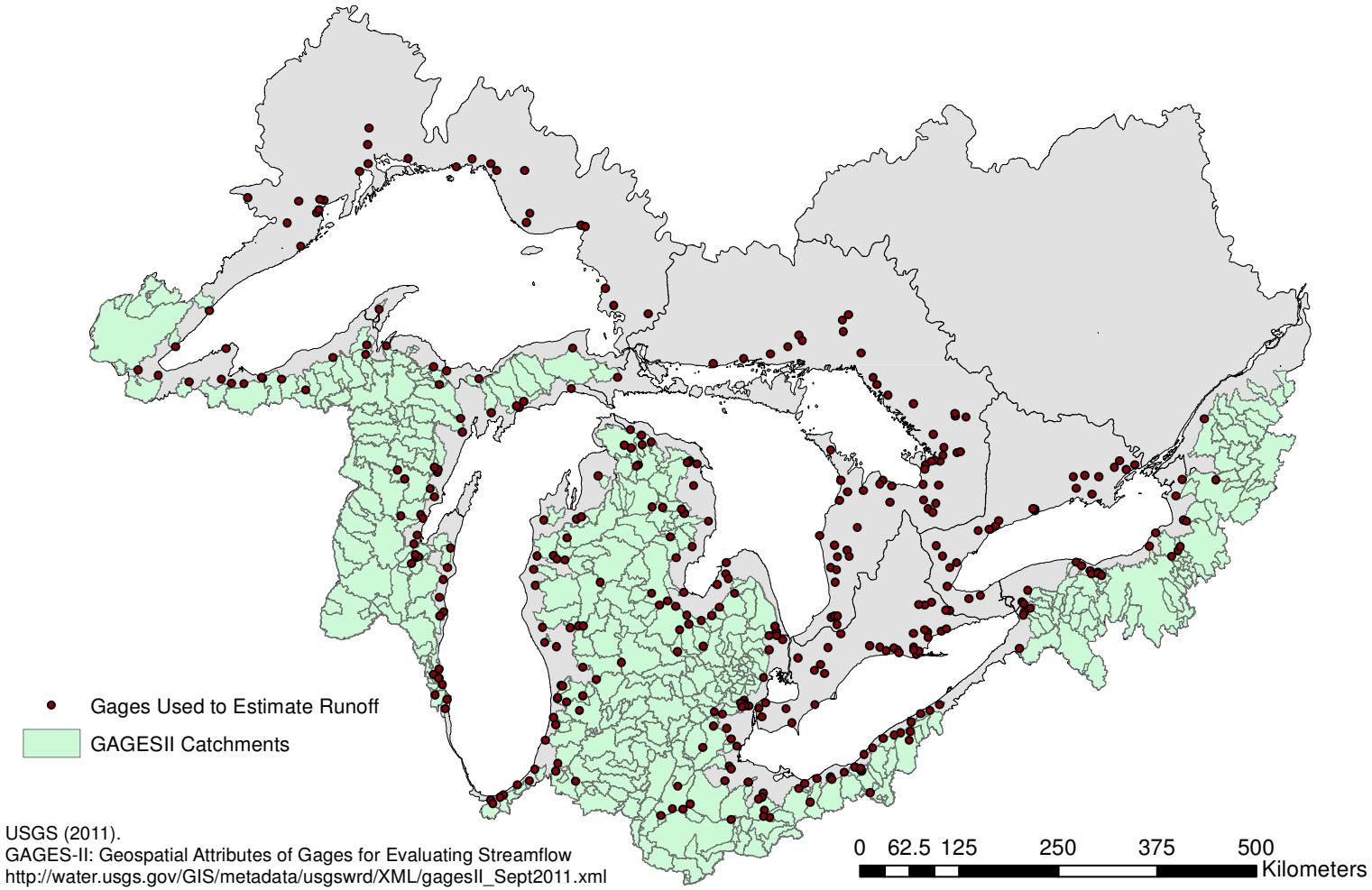


USGS (2011).
GAGES-II: Geospatial Attributes of Gages for Evaluating Streamflow
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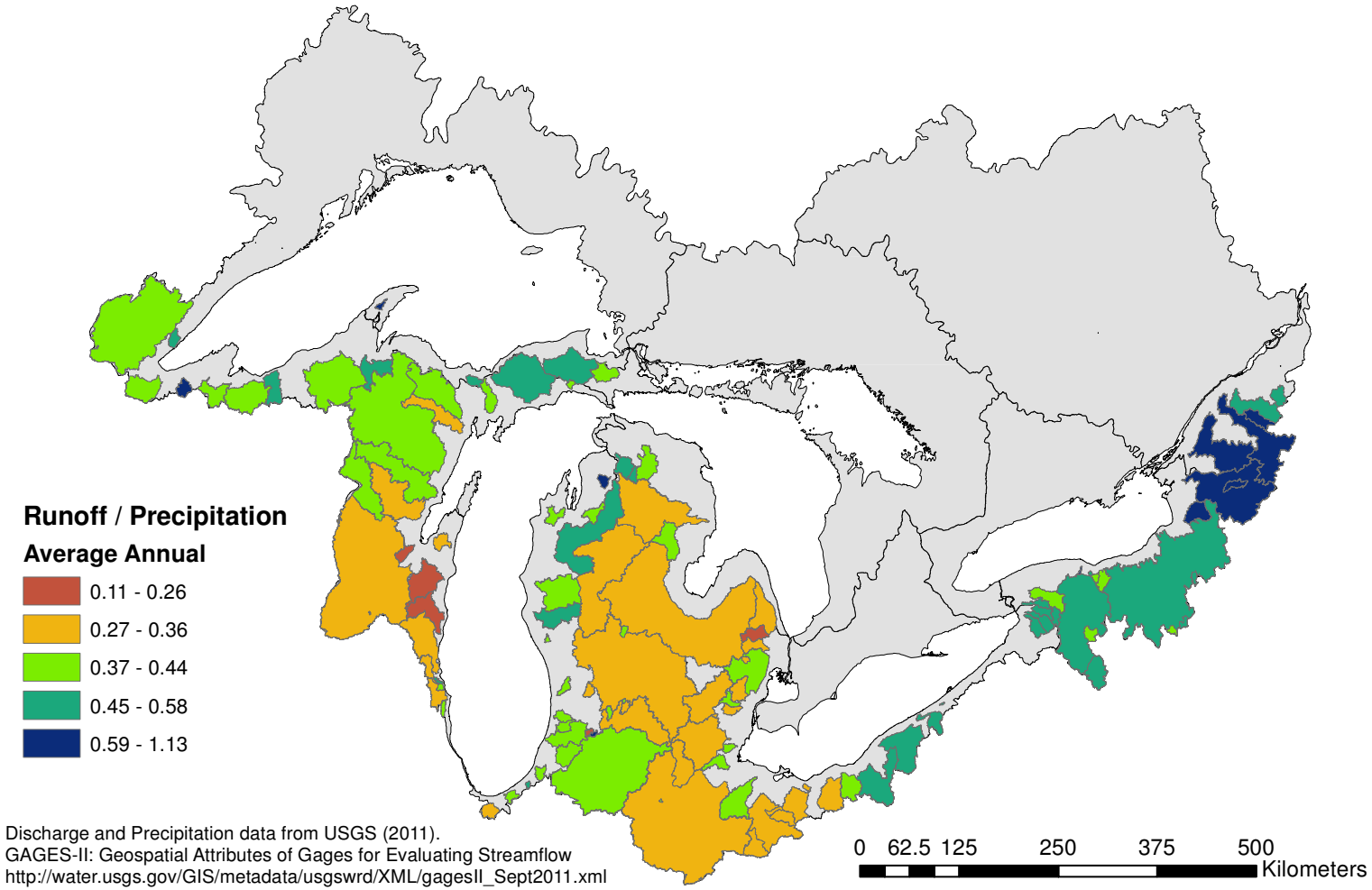


Discharge and Precipitation data from USGS (2011).
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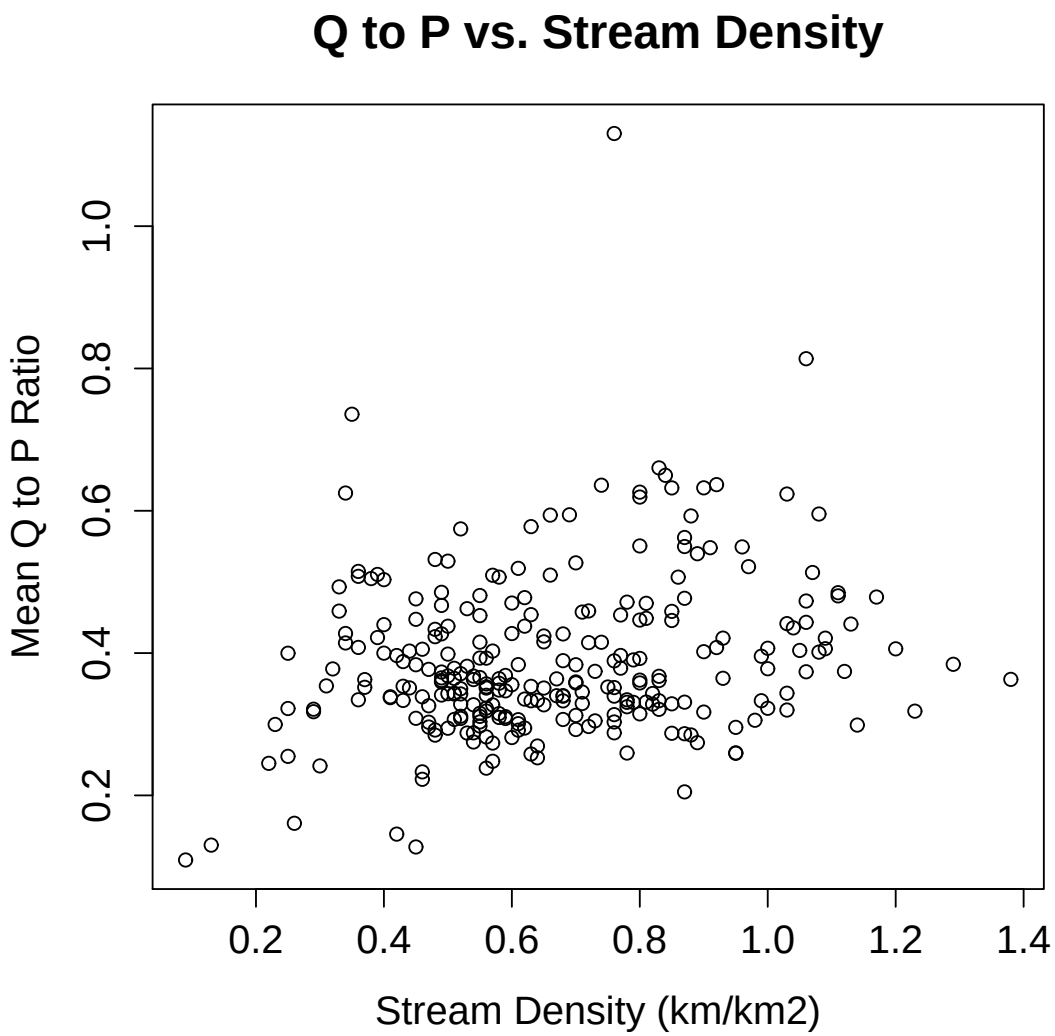

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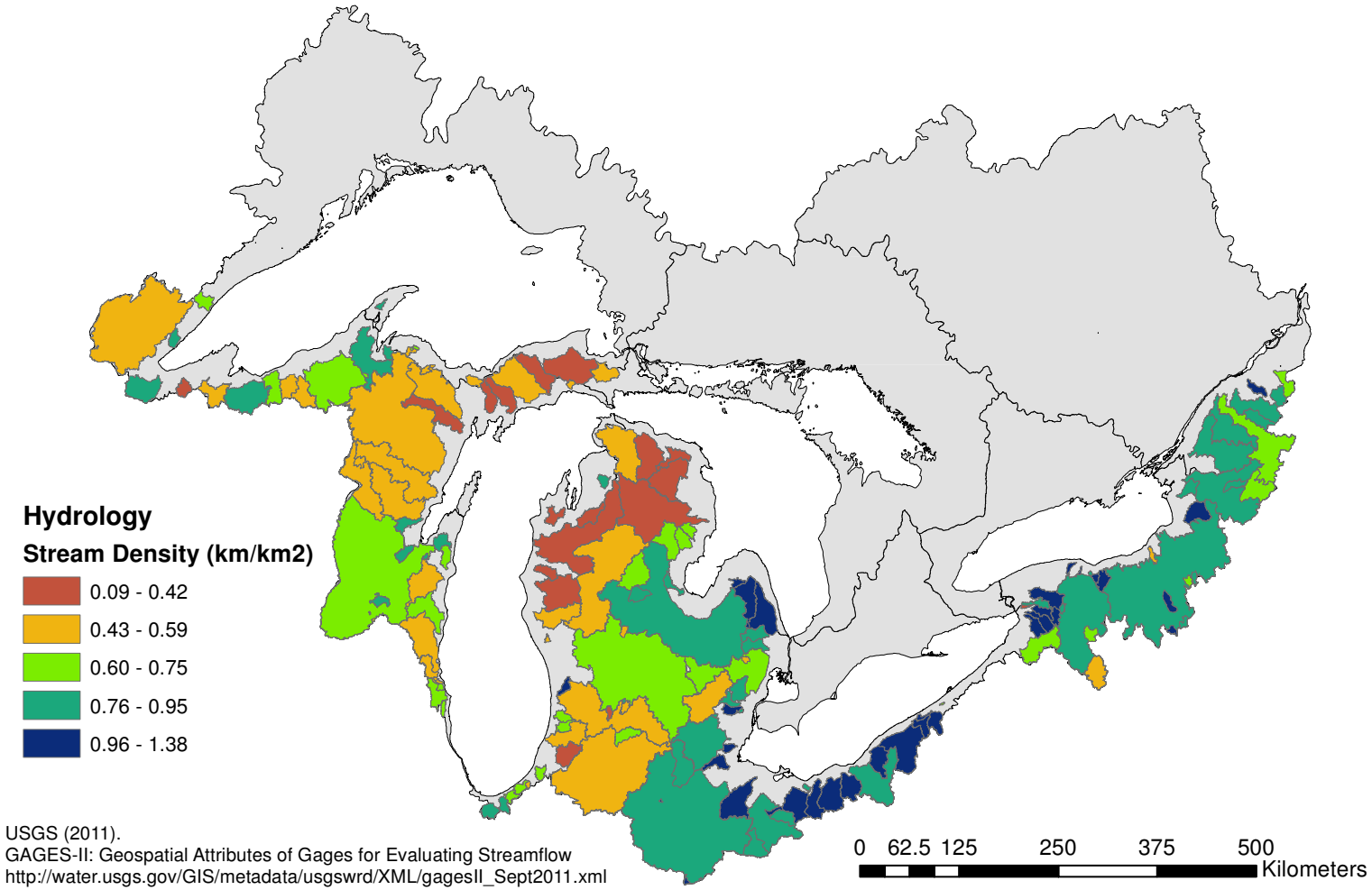


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# Subsurface Properties

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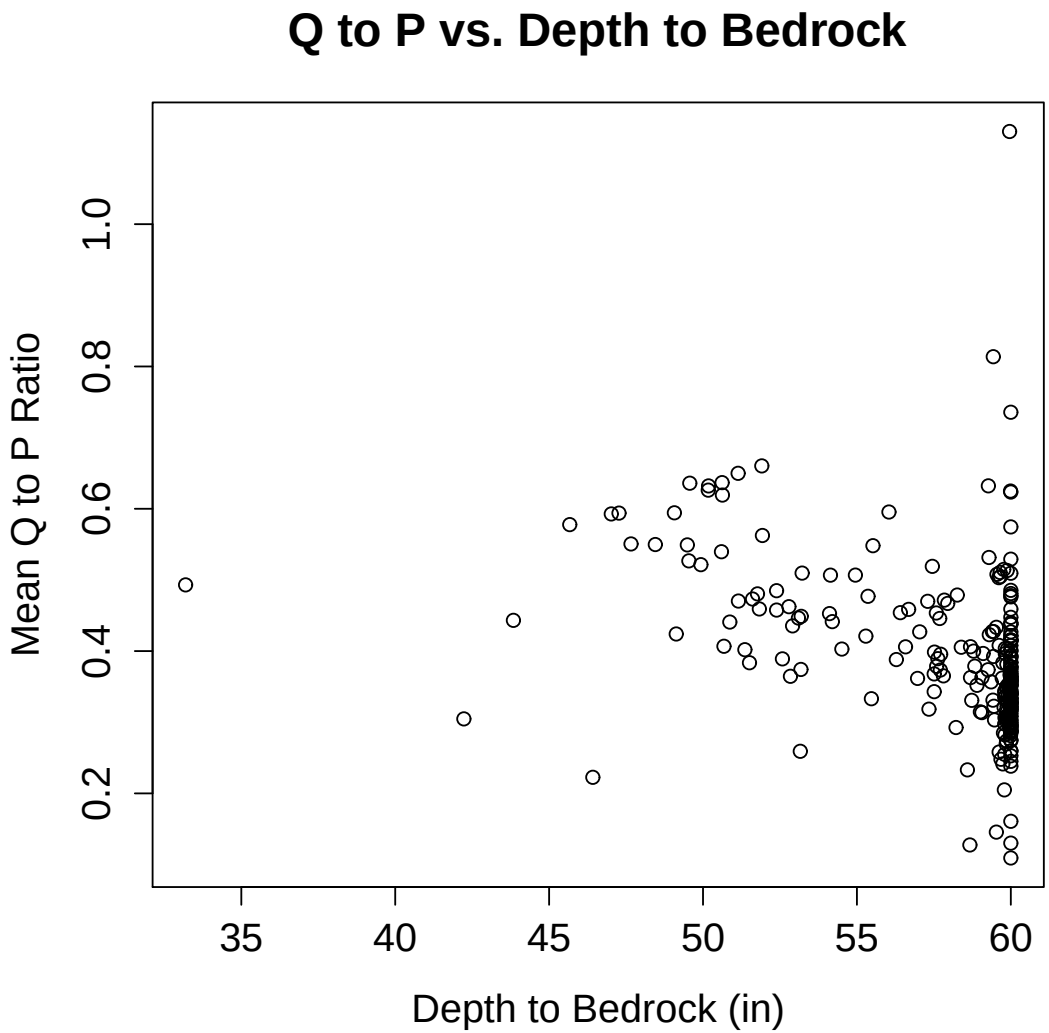

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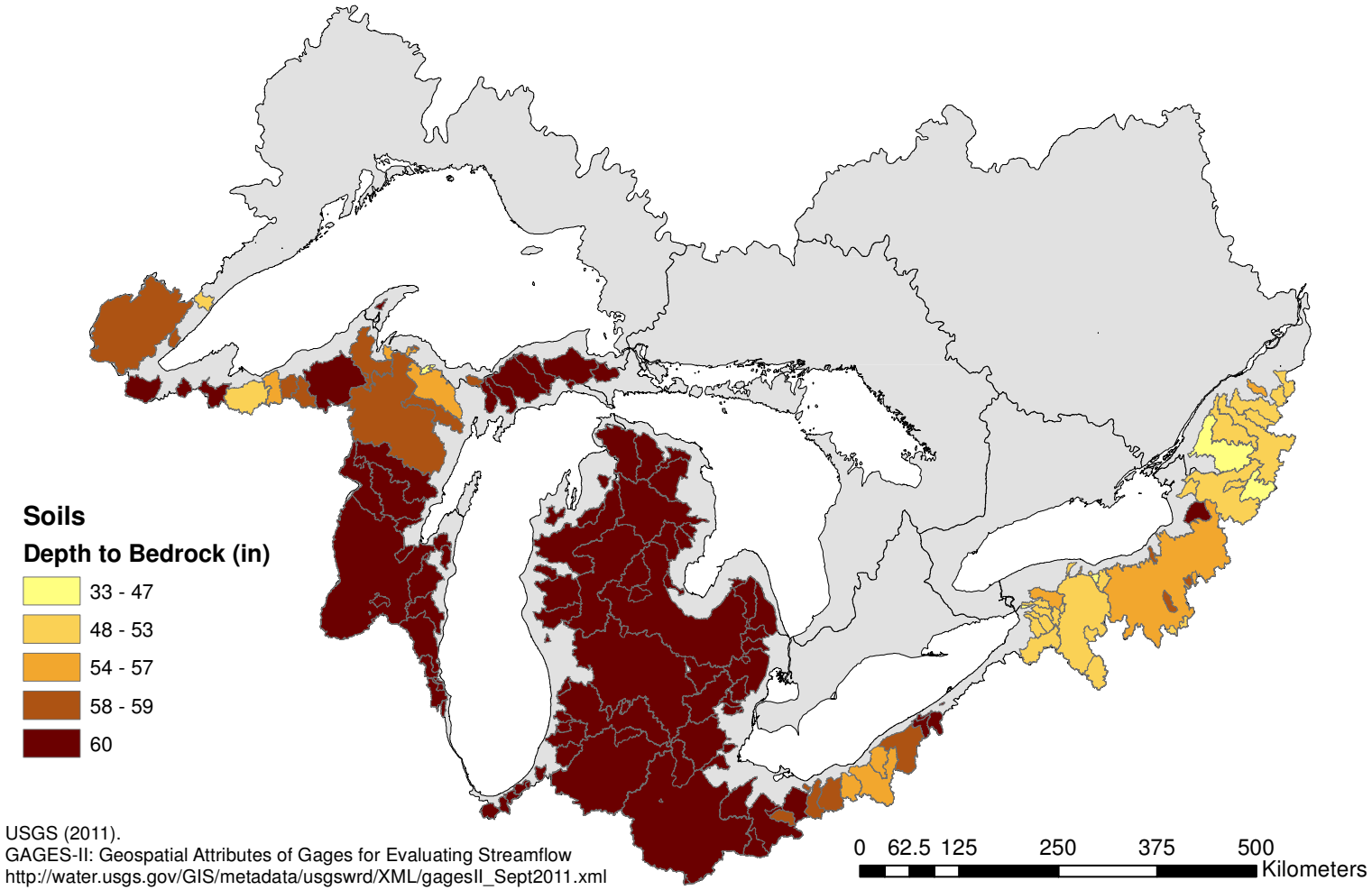


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# Land Cover

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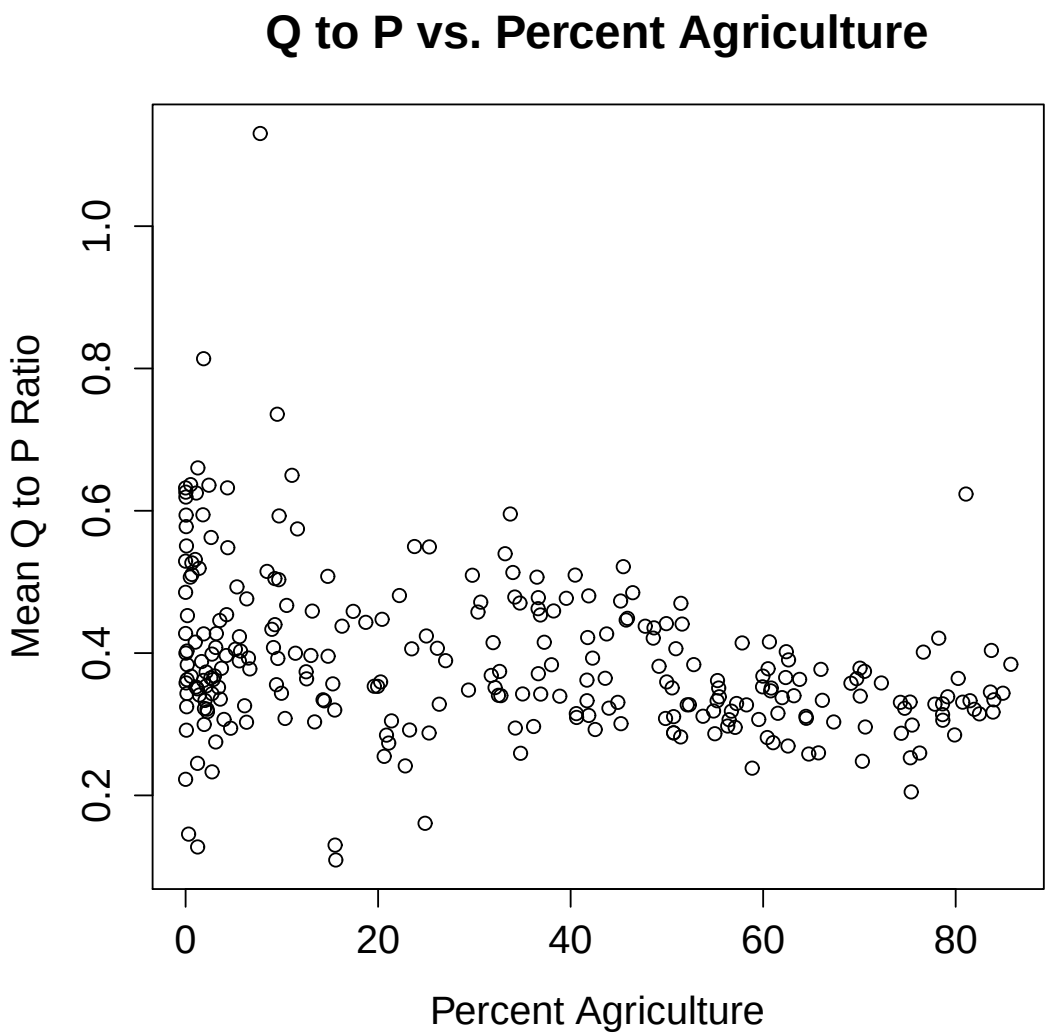
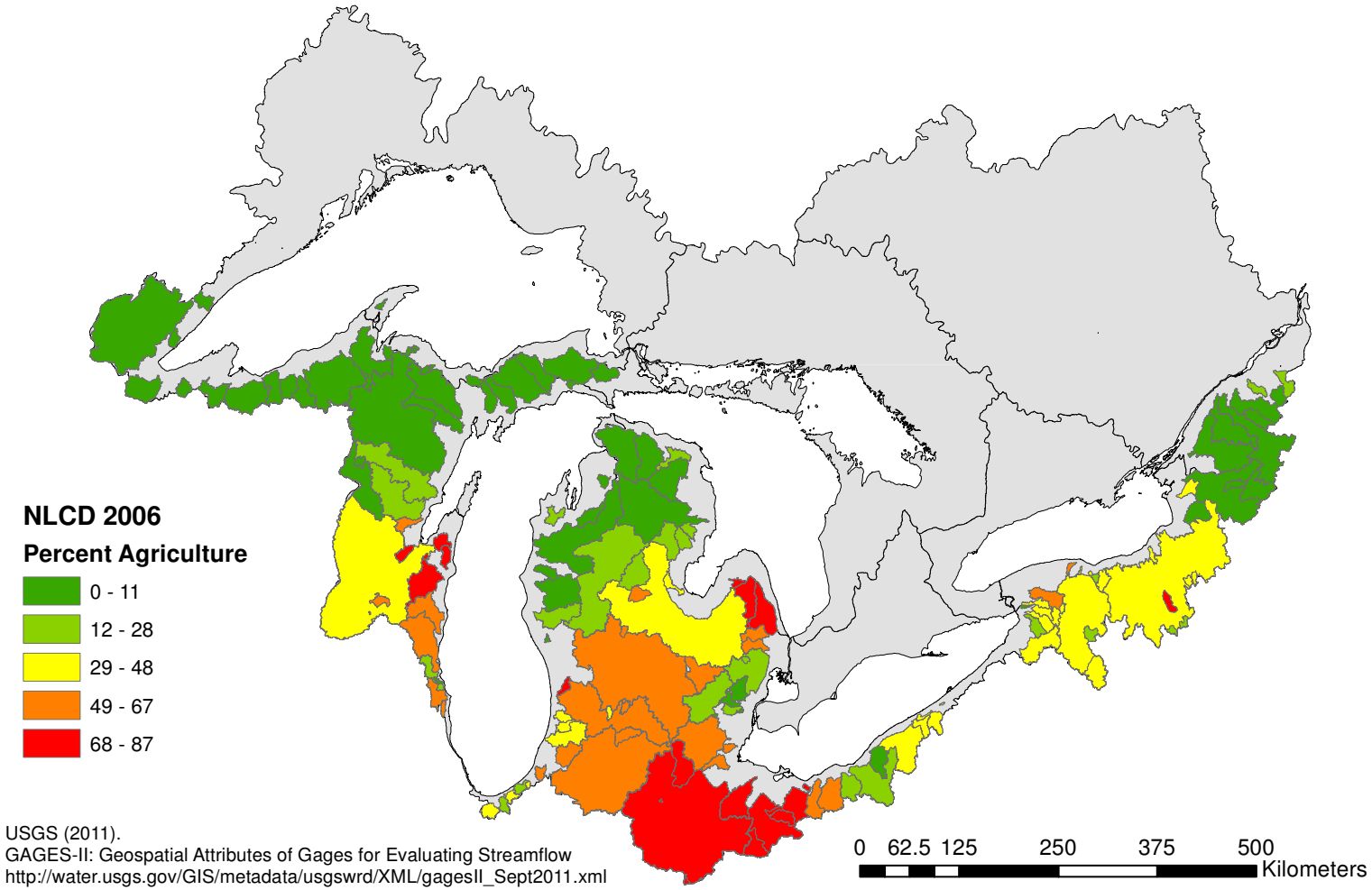

Q to P vs. Percent Agriculture
Mean Q to P Ratio
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
Percent Agriculture

# Land Cover

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# Climate

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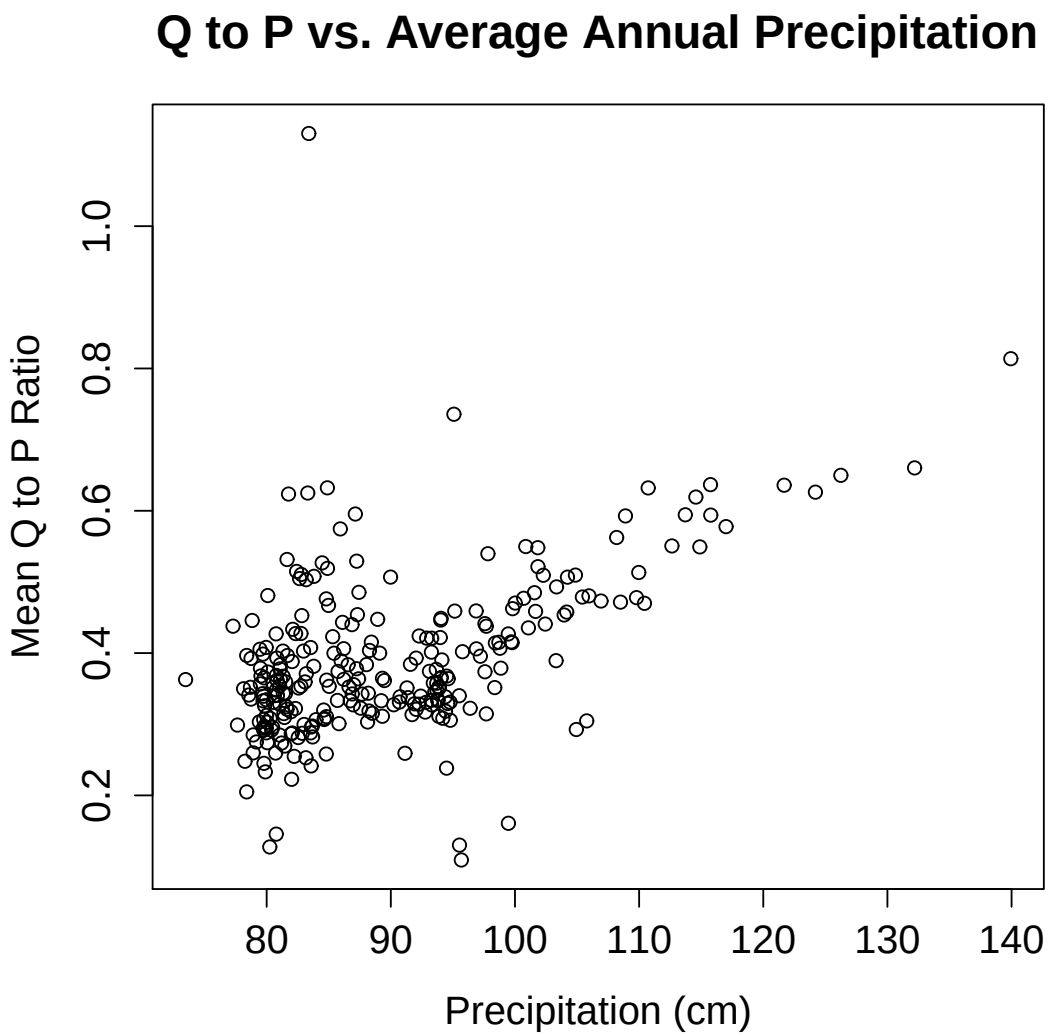
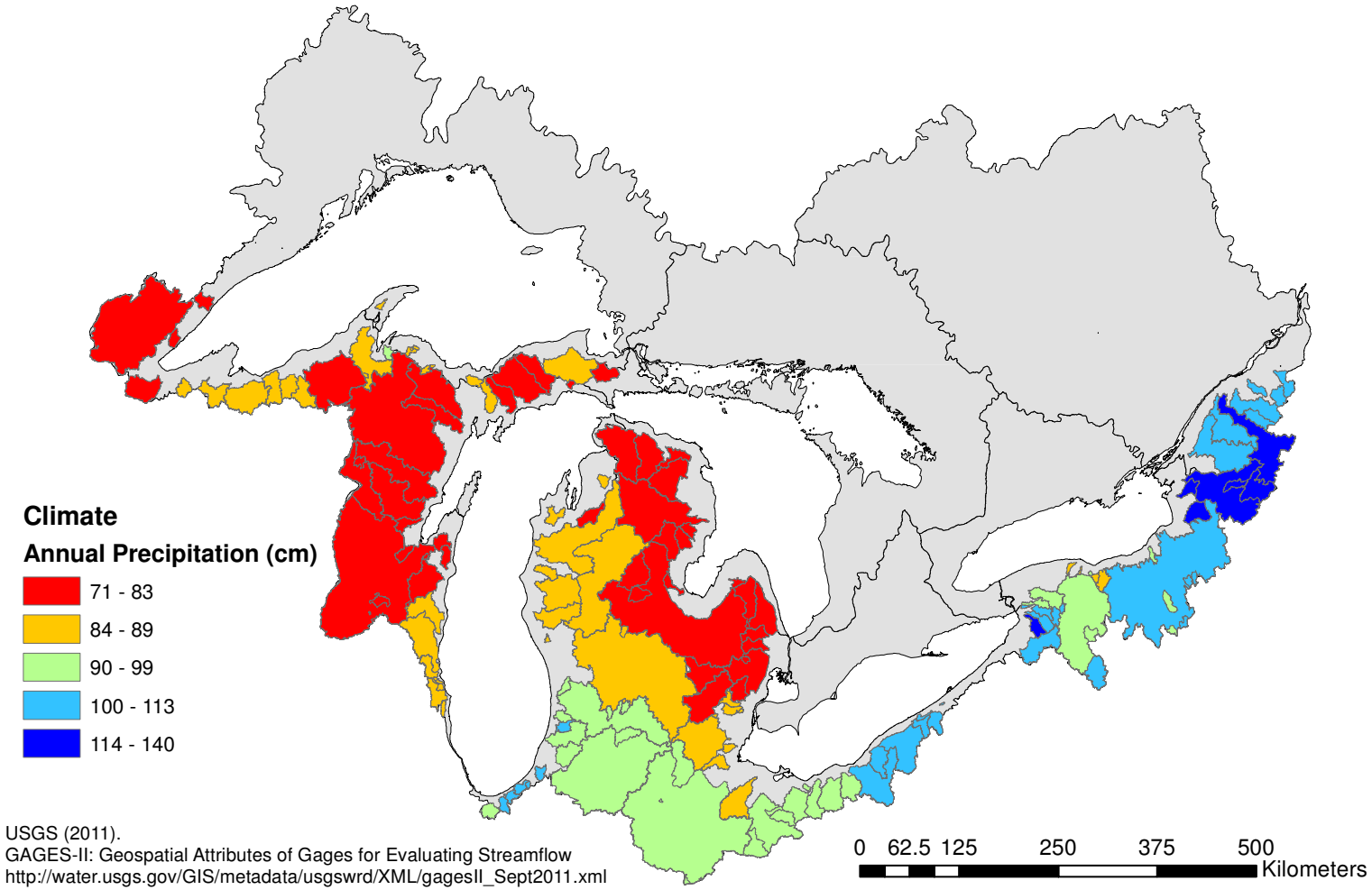

Q to P vs. Average Annual Precipitation
Mean Q to P Ratio
0.2
0.4
0.6
0.8
1.0
80
90
100
110
120
130
140
Precipitation (cm)

# Climate

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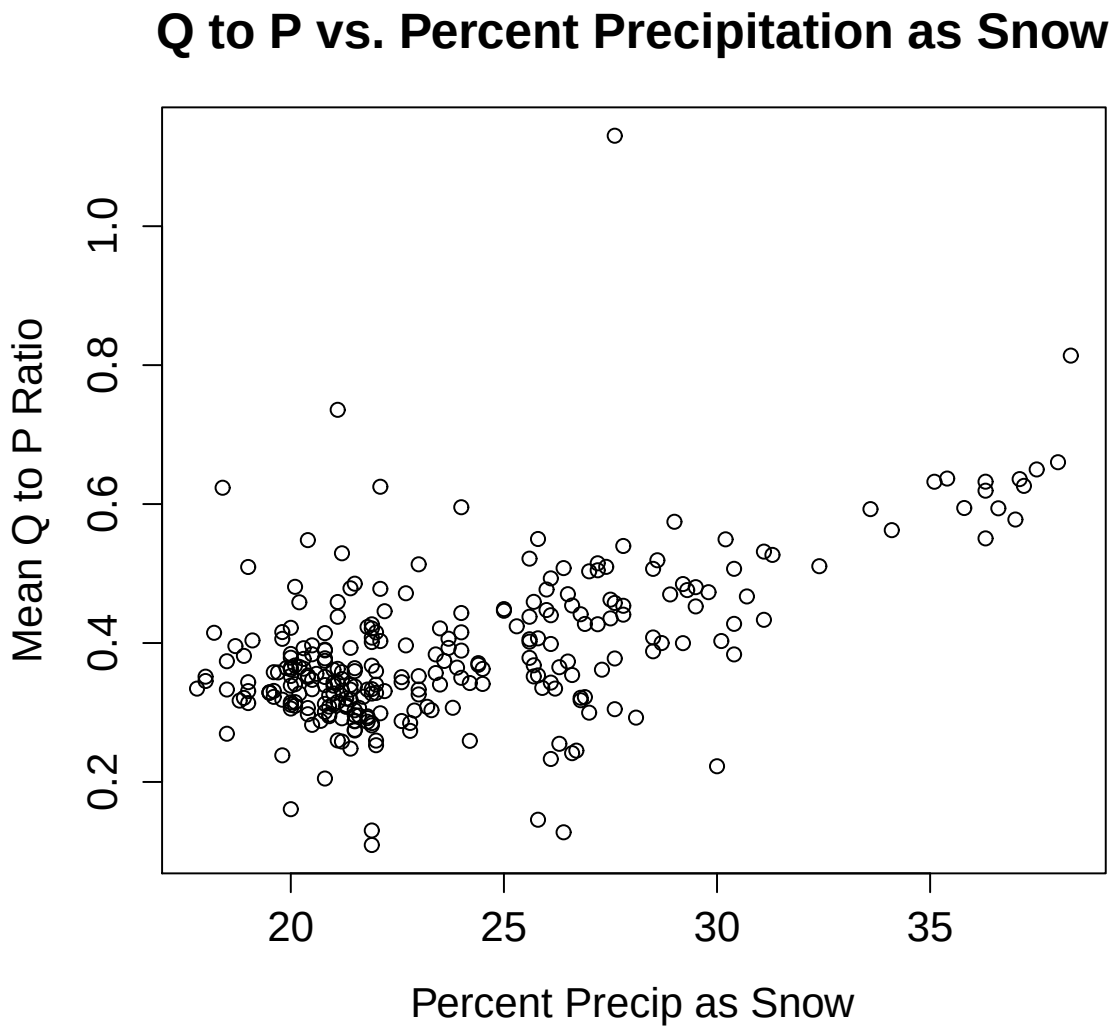
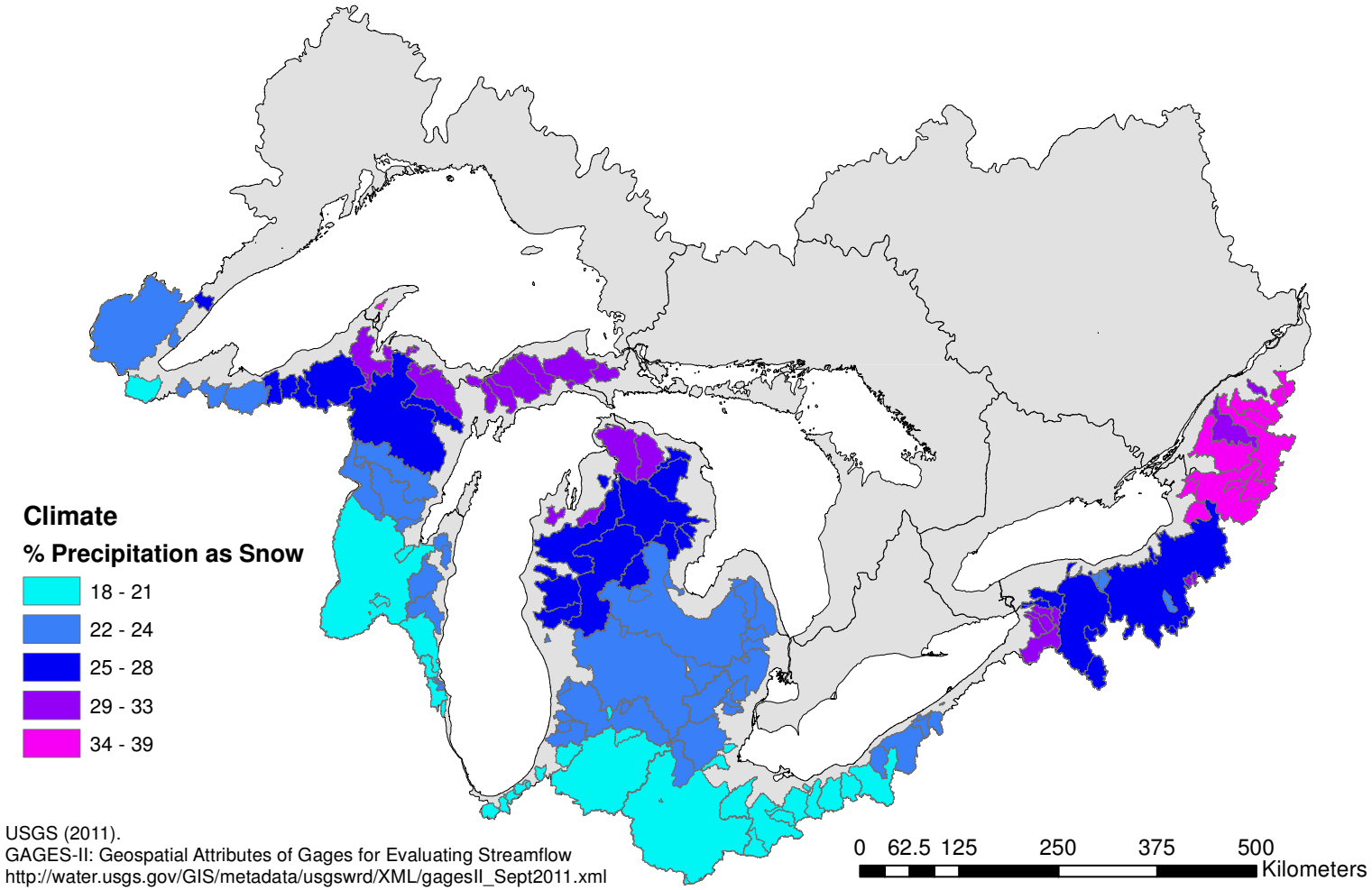

Q to P vs. Percent Precipitation as Snow
Mean Q to P Ratio
0.2
0.4
0.6
0.8
1.0
20
25
30
35
Percent Precip as Snow

# Climate

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3. Expand to entire Great Lakes Basin
4. Compare with other models?

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- LBRM is used to provide runoff estimates to the GL AHPS
- Calibration of LBRM can be improved by incorporating catchment characteristics
- Future work will provide a new and improved calibration that includes estimates of uncertainty

## Acknowledgements

- Tim Hunter, Alicia Ritzenthaler
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